
NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA
UTILITIES DEPARTMENT

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE

REPLACE SUBSTATION PROTECTIVE RELAY AND RELAY CASE

PROCEDURE NUMBER

WC 622 HVE 032

SIGNED:_____

(DATE)

APPROVED:_____

(DATE)

SAFETY PROFESSIONAL:_____

(DATE)

MANAGEMENT OFFICIAL:_____

(DATE)

REVISION A

REPLACE SUBSTATION PROTECTIVE RELAY
AND RELAY CASE

DISTRIBUTION

CODE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE
601.C3							
620							
622							
610.E1							
622.1							

REVISIONS

REV	DESCRIPTION	SIGNATURE	DATE
A	Initial Issue.		

REPLACE SUBSTATION PROTECTIVE RELAY AND RELAY CASE

Purpose:
Procedure to remove and replace a substation protective relay and it's case.

Potential Energy Sources:
1. 34.5/11.5/4.16 kv bus, breakers, isolation switches, and underground cables.
2. Circuit breaker 120/240 volt AC power.
3. Circuit breaker 125 volt DC power.
4. Switchboard 120/240 volt AC power.
5. Switchboard 125 volt DC power.

Tools and PPE:
Tools: Assorted hand tools, calibrated digital amprobe, calibrated multimeter, relay test set, and fiberglass ladder(if required). PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, safety glasses, and back brace if required to by Back Injury Prevention and Control Program. The class of rubber gloves and sleeves will depend on the exposure voltage as per the following: Class 0 - up to 1,000 volts, Class 1 - up to 7,500 volts, Class 2 - up to 17,000 volts, Class 3 - up to 26,500 volts, Class 4 - up to 36,000 volts.

References:
1. PWC Occupational Safety and Health Program Manual, PWCNORVAINST 5100.33E
2. Occupational Safety and Health Standards for General Industry 29 CFR PART 1910): Subpart I, Personnel Protective Equipment; Subpart R, Electrical Power Generation / Transmission / Distribution; Subpart S, Electrical
3. NFPA 70 E, Approach Distances To Exposed Energized Electrical Conductors and Circuit Parts
4. ANSI C2-1987, National Electrical Safety Code
5. PWC SOP# 600 HVE 6, PWC Switching or Breaker Operation
6. PWC SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

Procedures:
1. Assess surrounding conditions at substation and at switchboard where relay is mounted. When in a substation yard area, wear Nomex coveralls, hard hat, and safety shoes.

2. Perform switching operations to shift breaker load to alternate circuits. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

3. Open circuit breaker. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

4. Open, tag, and lock breaker isolations switches, or, lower/roll out breaker to disconnected position, then lock and tag. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

Note - If the work to replace the relay is located at an 11.5/4.16 kv switchgear, located indoors or outdoors, wear Nomex coveralls, safety shoes, and hard hat. If the work is located in a switchyard or substation control house then the only required PPE will be safety shoes. Be aware of, and avoid contact with, 120/240 VAC and 125 VDC control components and wires.

5. Open and tagout 67.5/115 control voltage to the relay. Refer to SOP WC 622 HVE 013.

6. Open and tagout 125 VDC control voltage to the relay. Refer to SOP WC 622 HVE 013.

7. Identify, label(if not already marked), and record all control wiring connections to the protective relay case. Refer to appropriate manufacture's shop drawings and appropriate substation control drawings.

8. Remove the relay and relay case.

9. Install the new relay.
   a) Install new case on the switchboard.
   b) Reconnect the control wires to the case. Refer to appropriate manufacture's shop drawings, appropriate substation control drawings, and recorded connections made in Step 7.

   c) Test new relay with relay tester. Ensure new unit meets manufacture's time curve characteristics. Refer to manufacture's Instruction Book for the particular relay involved.
   d) Ensure the relay's tap and time dial settings are set per the latest engineering relay coordination's recommended values.
   e) Place the relay in it's case with it's trip circuit open.

10. Remove tag, per SOP WC 622 HVE 013, and restore 125 volt DC control power to the relay.

11. Remove tag, per SOP WC 622 HVE 013, and restore 67.5/115 volt AC control power to the relay.

12. Ensure the circuit breaker is open; remove locks and tags; and close breaker isolation switches or roll in/raise breaker to connected position. Refer to SOP# HVE 6, PWC Switching Or Breaker

Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

13. Close the circuit breaker. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

14. Perform switching operations to shift load from alternate circuits to circuit
breaker. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

15. Close the relay’s trip circuit and observe that the relay is operating correctly. Be prepared to open trip circuit if time dial begins to move.

END